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PLOTTING PROGRAM FOR AERODYNAMIC LIFTING SURFACE THEORY

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ABSTRACT

This document is a description of and users manual for a USA FORTRAN IV computer program which plots the planform and control points of a wing. The program also plots some of the configuration data such as the aspect ratio. The planform data is stored on a disc file which is created by a geometry program (ref. 1). This program, the geometry program, and several other programs are used together in the analysis of lifting, thin wings in steady, subsonic flow according to a kernel function lifting surface theory.

2 USERS INSTRUCTIONS

2.1 INITIAL SETUP--360/67 TSS

For either batch or conversational processing the following TSS commands must be given. These commands are required once and only once for each user ID. The first three commands create the identification number file named IDFILE. This file contains four zeroes in binary form.

```
SHARE MEDAN,FSARTM,INIDFILE
CDS MEDAN,IDFILE
DELETE MEDAN
SHARE MEDAN,FSARTM,LSPROG.V1
```

2.2 CONVERSATIONAL MODE --360/67 TSS

All integer data should be entered in a 16I5 format and all floating point data in 8F10.0 format.

After logging on proceed as follows:

USER:
```
AMES ZETA
AMES USYSLIB
JOBLIBS SYSULIB
JBLB MEDAN
```

USER: Issue DDEFs, for example:

```
DDEF FT03F001,,PLOTFILE.ONE
DDEF FT04F001,,PLOTFILE.TWO
```
(LDEV=3 and LDEV=4 respectively. See below for LDEV.)

USER:
```
CALL PLOTM$
```

PROG:
```
ENTER ID1,ID2
```

USER: Enter identification numbers, ID1 and ID2.

ID1

Identification number of the geometry file. If a negative number is entered, then the most recent geometry file will be used.

Enter zero to terminate execution.

ID2

Identification number of AIM file. Enter a nonzero number only if the control points are to be plotted (see ICONPT below) and if the control points have been changed by the influence matrix program. If a negative number is entered, then the most recent AIM file will be used. Enter zero if no AIM file has been created or if the control points have not been changed by the influence matrix program or if the control points are not going to be plotted.

PROG: ENTER ISPEED,LDEV/SCALE

USER: Enter ISPEED,LDEV.
Enter SCALE (on a new line or card).

ISPEED

Enter 0 for 15 cps EBCDIC plotter. Enter 10 or 30 for 10 or 30 cps ASCII plotter. See ref. 2 for further explanation if needed.

LDEV --Logical DEVice number

Enter 0 for on line conversational plotting. Otherwise enter an integer other than 5, 6, 7, 9, or 11 when making a plot file. It is generally advisable to make a plot file rather than plotting on line. DDEF commands such as the ones previously given (LDEV=3 and 4) must be entered for each plot or set of plots, of which there may be several.

SCALE

The default value is 2. This will produce a plot on a 27.94X43.18 cm^2 (11X17 inch) page when using a 5 mil Zeta plotter. When using a standard 10 mil Zeta plotter or if the program is converted for use with a CALCOMP PLOTTER, enter 1.0 to obtain a 27.94X43.18 cm^2 (11X17 inch) page. SCALE governs the

size of the entire plot. Compare fig. 2 with fig. 1

PROG: ENTER ICONPT,ICONSF,ILABEL,ITEXT

USER: Enter ICONPT,ICONSF,ILABEL,ITEXT.

ICONPT

Any non-zero integer entered for this variable will cause the control point locations to be plotted. Otherwise they will not be plotted. Compare fig. 3 with fig. 1.

ICONSF

Any non-zero integer will cause flap and flap data not to be plotted. Otherwise they will be plotted.

ILABEL

Any non-zero integer will cause a new title to be read if ITEXT=0. Otherwise a new title will not be read. Compare fig. 5 with fig. 1.

ITEXT

Any non-zero integer will cause configuration information not to be plotted. Otherwise the configuration information will be plotted. This information consists of title, aspect ratio, long./lat. ref. length, and taper ratio. Compare fig. 4 to fig. 1. If there is a control surface, the configuration information will include the hinge line sweep angle in degrees, the flap area/wing area ratio, and the flap ref. chord/wing ref. chord ratio.

PROG: If ILABEL≠0 and ITEXT=0 the program will request the user to 'ENTER LABEL'

USER: Enter new title. The new title may be up to 42 characters in length and preferably should be centered within the 42 character space.

See fig. 5 for example.

PROG: ENTER PSIZE,RSSIZE,RPLAB,CSIZE(OR DEFAULT)

USER: Enter PSIZE,RSSIZE,RPLAB,CSIZE.

PSIZE --Planform SIZE

The default value is 10. This will cause the planform to be scaled so as to fit in a box 25.15 cm@ (9.9 inches) high and 22.86 cm@ (9 inches) wide. This variable affects both the size of the box in which the planform is plotted and the size of the control point symbols (if any). Compare fig. 6 to fig. 1.

RSSIZE --Relative control point Symbol SIZE

The default value is 15./14. If PSIZE and RSSIZE are both defaulted, then the control point symbols will be .38 cm@ (.15 inches) in height. The actual size of the control point symbols is .14*(FACTOR/2.)*(PSIZE/10.)*RSSIZE. Compare figs. 6, 7, and 1. This variable is irrelevant unless ICONPT≠0.

RPLAB --Relative control Point LABel

The default value is 15./14. If PSIZE and RPLAB are both defaulted, then the characters of the label "CONTROL POINT LOCATION" will be .38 cm@ (.15 inches) in height. The actual size of this label is equal to (.14)*(FACTOR/2.)*(PSIZE/10.)*RPLAB. Compare figs. 6, 8, and 1. This variable is irrelevant unless ICONPT≠0.

CSIZE --Character SIZE of Title

The default value is .20. It will produce the title and wing data with characters .504 cm@ (.20 inches) high. A value of .1 will produce characters .254 cm@ (.10 inches) high. Compare fig. 9 to fig. 1.

PROG: The program now creates a plot or plot file.

PROG: ANOTHER PLOT OF THIS WING? (1=Y,0=N)

USER: Enter 1 if another plot is desired. Enter 0 if another plot is not desired. If another plot is to be made the program loops back to the point where ICONPT, etc. is entered and input resumes at this point. If another plot is not to be made, control returns to the main program to the point where ID1 and ID2 are to be entered. At this point more plots of other planforms may be made or else by entering ID1 as zero execution can be terminated.

2.3 BATCH MODE---360/67 TSS

The batch mode operates the same as the conversational mode with the sole exception that on line plotting is not allowed. Therefore LDEV must be entered and the appropriate DDEF cards for the plot file must be included.

2.4 OTHER COMPUTERS

Remove all calls to GEMFIL, AIMFIL, and LOOKUP and use appropriate control cards. These subroutines issue DDEFs and release commands making control cards unnecessary on TSS with the exception of those for making plot files. Only the main program needs to be changed.

3 CONVERSION TO CALCOMP

This program was originally designed for a CALCOMP plotter and can easily be modified to be run on one. To do this, remove calls to PON, POFF, and SMODE (or insert dummy subroutines). Also change the defaults for variables as instructed in the program listing and modify the call to PLOT.

4 MAKING PLOTS FROM PLOT FILES

USER: NOTALKS (To prevent plot from being ruined by system messages.)

REDIT PLOTFILE.ONE

SYS: LOADING PLOTFILE.ONE
REKEYED
EDIT

USER: BRIEF N
P999999

SYS: A few characters are printed at the terminal after which the Zeta plotter controller directs the remaining data to the plotter, which makes the plot.

SYS: EOF
EDIT

USER: LOAD PLOTFILE.TWO (if there is another plot file)

SYS: LOADING PLOTFILE.TWO
REKEYED

USER: P999999

SYS: A few characters are printed at the terminal after which the Zeta plotter controller directs the remaining data to the plotter, which makes the plot.

SYS: EOF
EDIT

USER: Either continue making plots as above or else type QUIT to get back to TSS.
OKTALKS

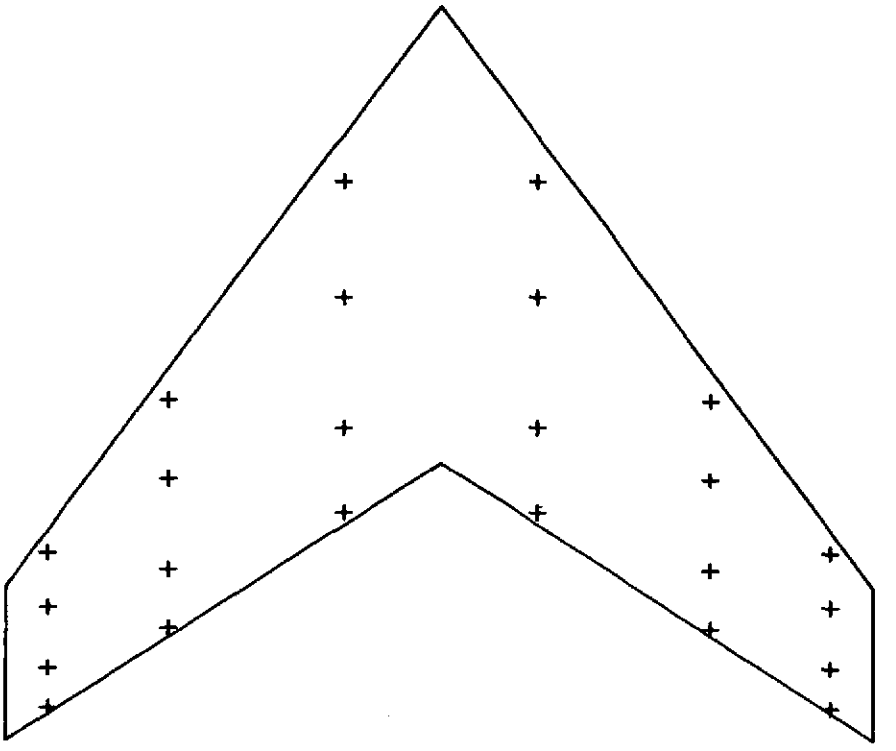
5 REFERENCES

1. Medan, R. T.: Geometry Program for Aerodynamic Lifting Surface Theory. NASA Rept. No. TMX-62,309.

2. Zeta Plotter 230 Compatible Plotting Subroutines. Reference Manual, Release 3.5, Zeta Research Inc., May 1973.

10 □

This figure reduced 50% for reproduction purposes.



+ CONTROL POINT LOCATION

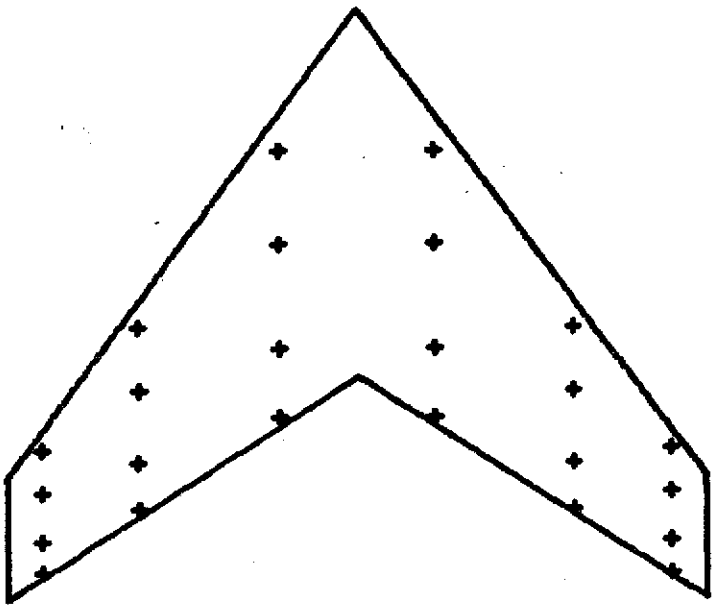
WING DATA		
ASPECT RATIO	=	2.82841
LONG./LAT. REF. LENGTH	=	.76606
TAPER RATIO	=	.33333

WARREN 12 PLANFORM

Figure 1. - The maximum plot (base plot) for a wing without control surfaces. ICONPT≠0 while all other variables are defaulted.

10 0

This figure is actual size.



+ CONTROL POINT LOCATION

WING JOINT
RESPECT RATIOS
LONG/LAT. REF. LENGTH = .16606
TAPER RATIOS

WARREN 12 PLANFORM

Figure 2. - The effect of changes in the variable SCALE on the base plot (fig. 1). SCALE=.8 while the other parameters are the same as for the base plot.

NO REDUCTION

10 □

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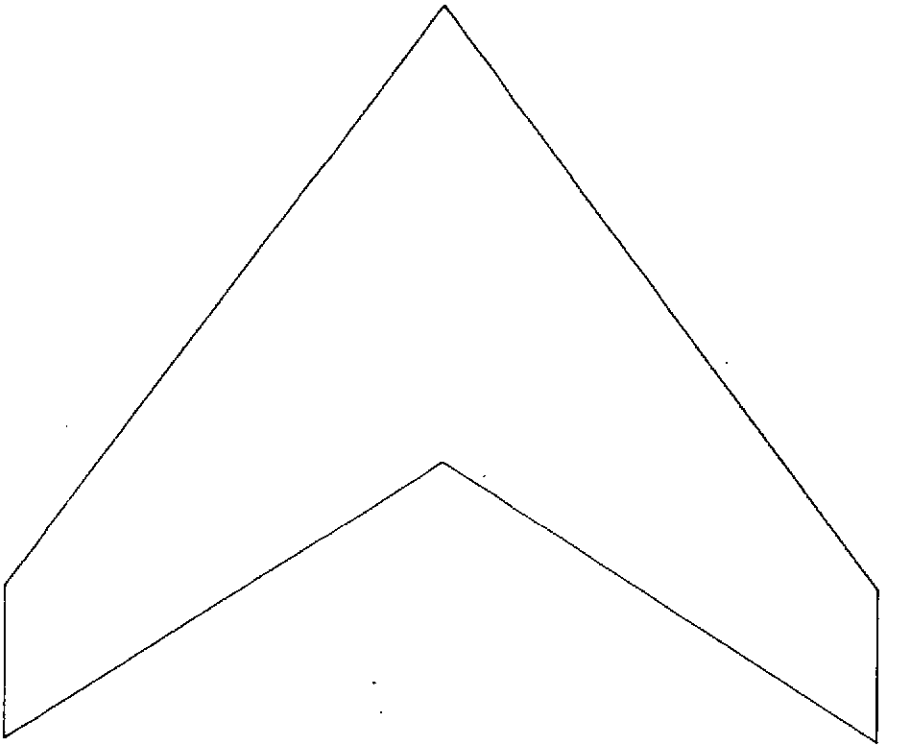

WING DATA

ASPECT RATIO	=	2.82841
LONG./LAT. REF. LENGTH	=	.76606
TAPER RATIO	=	.33333

WARREN 12 PLANFORM

Figure 3. - The effect of changes in the variable ICONPT on the base plot (fig. 1). ICONPT=0 while the other parameters are the same as for the base plot.

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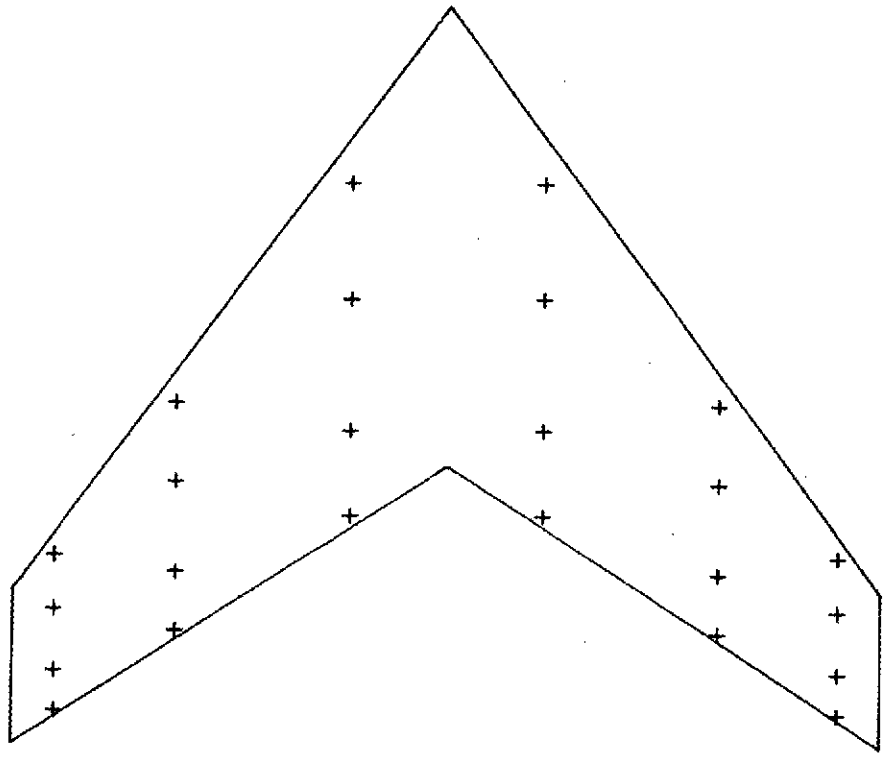

Figure 4. - The effect of changes in the variable ITEXT on the base plot (fig. 1). ITEXT=1 while the other parameters are the same as for the base plot.

10 0

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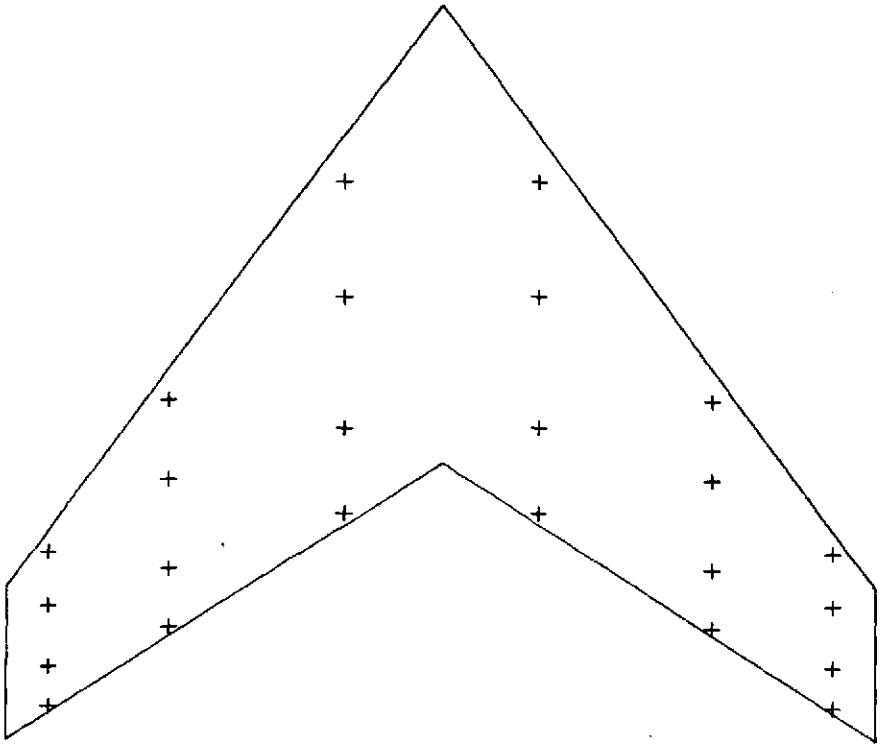
for reproduction purposes.



+ CONTROL POINT LOCATION

WING DATA

ASPECT RATIO	=	2.82841
LONG./LAT. REF. LENGTH	=	.76606
TAPER RATIO	=	.33333

THIS IS A NEW TITLE

Figure 5. - The effect of ILABEL and entering a new title. ILABEL=1 and a new title was entered while all other parameters are the same as for the base plot.

10 0

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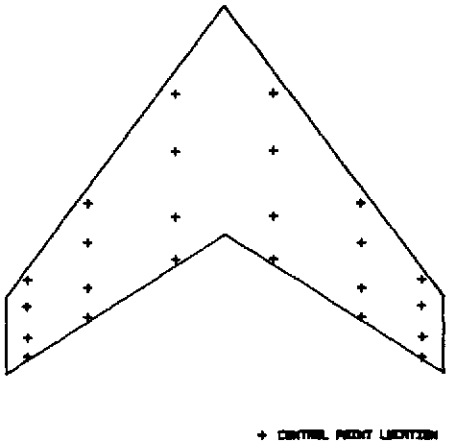

+ CONTROL POINT LOCATION

WING DATA

ASPECT RATIO	=	2.82841
LONG./LAT. REF. LENGTH	=	.76606
TAPER RATIO	=	.33333

WARREN 12 PLANFORM

Figure 6. - The effect of changes in the variable PSIZE on the base plot (fig. 1). PSIZE=5. while the other parameters are the same as for the base plot.

10 0

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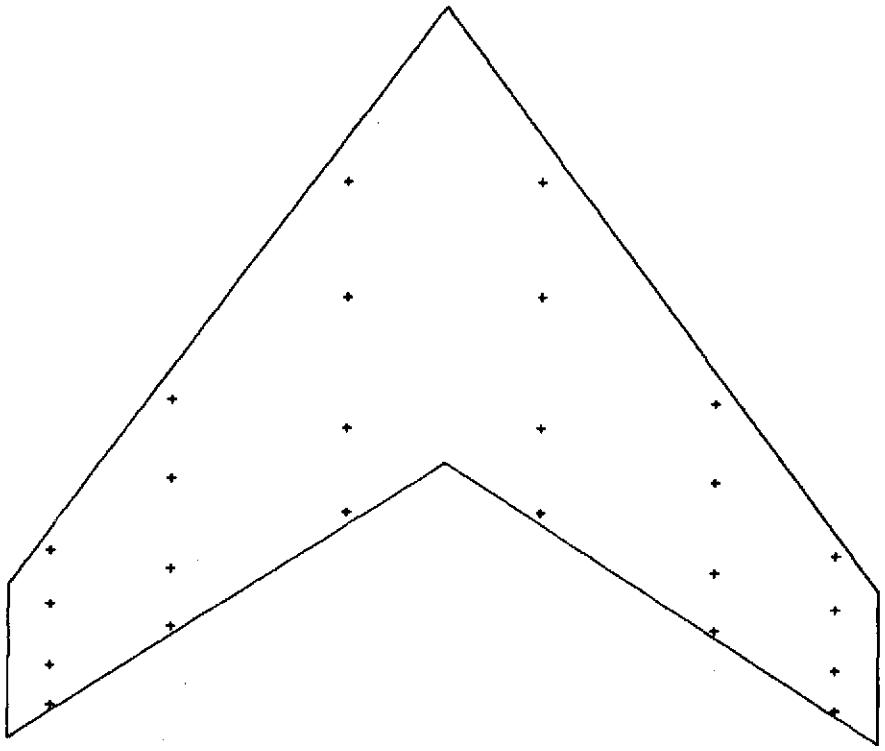

+ CONTROL POINT LOCATION

WING DATA

ASPECT RATIO	=	2.82841
LONG./LAT. REF. LENGTH	=	.76606
TAPER RATIO	=	.33333

WARREN 12 PLANFORM

Figure 7. - The effect of changes in the variable RSSIZE on the base plot (fig. 1). RSSIZE=.537 while the other parameters are the same as for the base plot.

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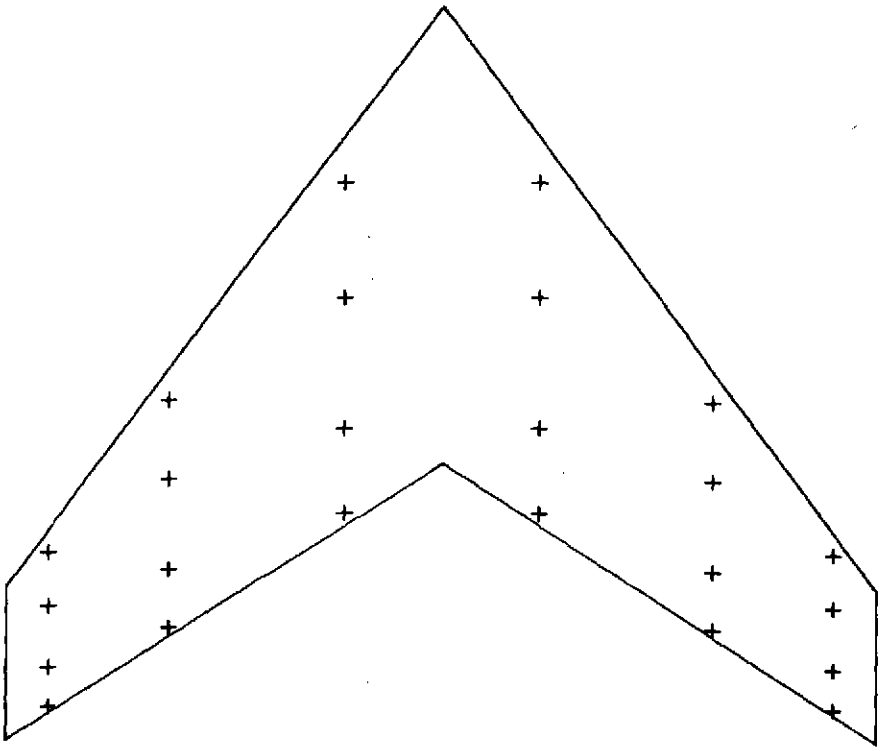

+ CONTROL POINT LOCATION

WING DATA

ASPECT RATIO	=	2.82841
LONG./LAT. REF. LENGTH	=	.76606
TAPER RATIO	=	.33333

WARREN 12 PLANFORM

Figure 8. - The effect of changes in the variable RPLAB on the base plot (fig. 1). RPLAB=.537 while the other parameters are the same as for the base plot.

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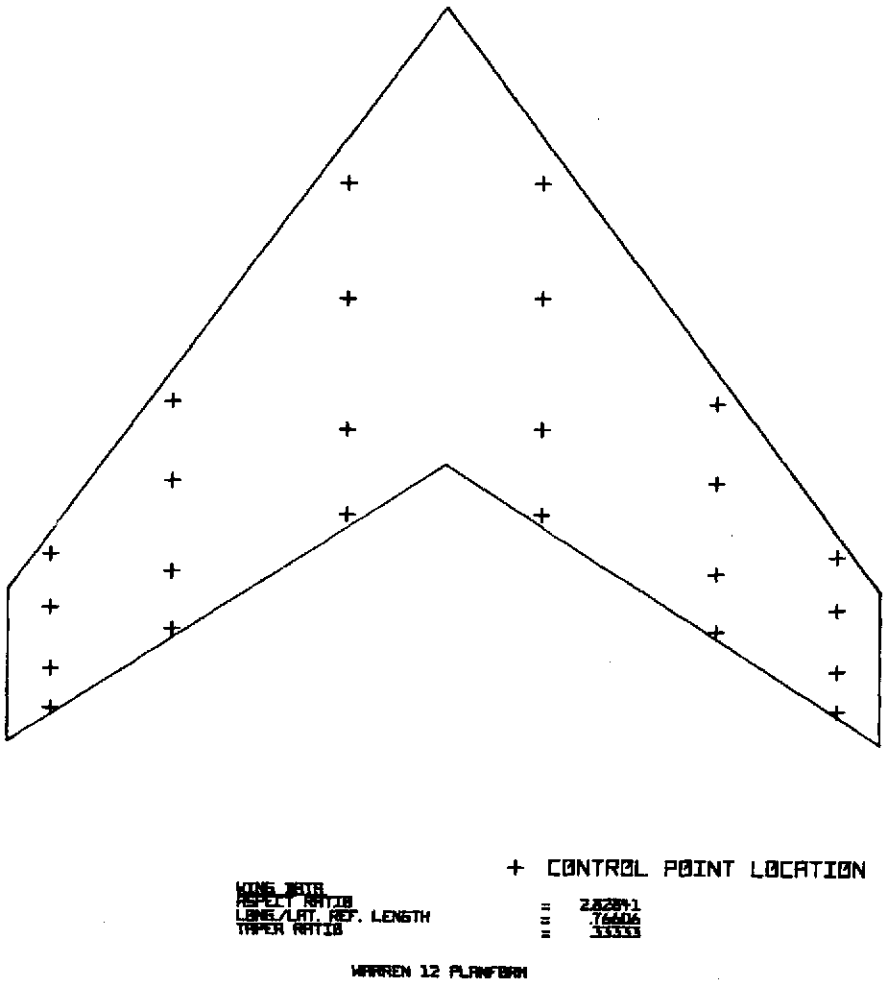

Figure 9. - The effect of changes in the variable CSIZE on the base plot (fig. 1). CSIZE=.1 while the other parameters are the same as for the base plot.

```
C
C.....WING PLANFORM PLOTTING PROGRAM.
C.....THIS PROGRAM WITH ITS SUBROUTINE RUNS A 5-MIL ZETA PLOTTER
C.....WITH SOFTWARE VERSION 3.3 (MAY 1973).
C.....THE PROGRAM CAN BE CONVERTED EASILY TO RUN A CALCOMP PLOTTER BY
C.....DELETING CALLS TO PON,POFF, AND SMODE.  ALSO THE INITIAL CALL
C.....TO PLOTS OR PLOTF NEEDS TO BE CHANGED.
C
C
C.....FOR THE AMES' VERSION OF THIS PROGRAM ONLY ONE DDEF COMMAND NEEDS
C.....TO BE GIVEN BEFORE RUNNING THE PROGRAM.  THIS IS FOR THE LOGICAL
C.....UNIT NUMBER G&VEN BY THE VALUE OF LDEV, WHICH IS INPUT IN SUBROUTINE
C.....WPLOT.  THIS DDEF COMMAND IS NOT NEEDED IF THE PLOTTING IS TO BE DONE
C.....ON LINE. (I.E. LDEV=0).  AN EXAMPLE OF AN APPROPRIATE DDEF COMMAND IS
C.....DDEF FT10F001,,PLOTFILE
C.....PLOTFILE IS A VALID DSNAME OF THE USER'S CHOICE.  DO NOT INPUT LDEV AS
C.....5,6,7,9, OR 11.   IN THE ABOVE EXAMPLE LDEV=10
C
      DOUBLE PRECISION ETA, STHETA
      REAL MACH, LAMDAC
      INTEGER PP, CWTYPE, SWTYPE, UNSYM, R7,R5,U11
C.....DIMENSION DUMAR1, X, AND Y BY 4 GREATER THAN
C.....ETA, STHETA, XSILIP, AND CORDIP.
      DIMENSION LABEL(26), DUMAR1(387), ETA(383), STHETA(383),
     1CHICP(20), NINDEX(47), XSILIP(383), CORDIP(383),
     2X(387), Y(387)
      DATA IWORDL /4/
      DATA R7 /07/
      DATA R5/5/, U11/11/
10    CONTINUE
      WRITE(6,8000)
8000  FORMAT (' ENTER ID1, ID2' )
      READ(R5,8001) ID1,ID2
8001  FORMAT(16I5)
      IF( ID1.EQ.0) STOP 777
C
C.....ANY IDENTIFICATION LESS THAN 0 CALSES A LOOKUP OF THE CURRENT NUMBER
C.....ON THE IDENTIFICATION NUMBER FILE.
```

```
C.....SUBROUTINE LOOKUP CONTAINS CALLS TO AMES' LIBRARY PROGRAMS.
C
      IF(ID1.LT.0 .OR. ID2.LT.0) CALL LOOKUP(ID1R,ID2R,ID3,ID4)
      IF(ID1.LT.0)ID1=ID1R
      IF (ID2.LT.0) ID2=ID2R
C
C
C.....SUBROUTINE GEMFIL IS FOR THE AMES' VERSION OF THE PROGRAM ONLY.
C.....GEMFIL COMPUTES THE GEOMETRY FILE DSNAME AND ISSUES THE DDEF COMMAND
C.....TO THE TSS OPERATING SYSTEM.
C
      CALL GEMFIL(ID1)
      REWIND R7
      READ (R7) ID, PP, NF,CWTYPE, SWTYPE, UNSYM, NDL, NDT,
     1NN, JJMAX, NFLAPS, LABEL, NLBL
      NDUM1 = JJMAX-1
      READ (R7) (CHICP(I),I=1,PP), (NINDEX(I),I=1,NF),
     1(DUMAR1(I),I=1,NDUM1), TANLLL, TANLLR, (DUMAR1(I),I=1,NDUM1),
     1(DUMAR1(I),I=1,NDUM1),
     2TANLTL, TANLTR, (DUMAR1(I),I=1,NDUM1),
     3(ETA(I),I=1,JJMAX), (STHETA(I),I=1,JJMAX),(XSILIP(I),I=1,JJMAX),
     4(CORDIP(I),I=1,JJMAX), BREF, CBARB2, AR, TR
      IF(NFLAPS.NE.0) READ(R7) DUM1, LAMDAC, CBFCBW,
     1AFAW, ETA1, ETA2, XLF1, XLF2, CF1, CF2, XSI1, XSI2
      IF(NFLAPS.NE.0)LAMDAC=LAMDAC*57.2957795
      IF(ID2. EQ. 0) GO TO 20
C
C.....THE INFLUENCE MATRIX FILE CONTAINS SOME CONTROL POINT INFORMATION
C.....WHICH MAY BE DIFFERENT FROM THE DEFAULT CONTROL POINTS ON
C.....THE GEOMETRY FILE.
C
C
C.....SUBROUTINE AIMFIL IS ONLY FOR THE AMES' PROGRAM VERSION.  AIMFIL
C.....COMPUTES THE DATASET NAME OF THE INFLUENCE MATRIX FILE AND ISSUES
C.....THE APPROPRIATE DDEF COMMAND TO THE TSS OPERATING SYSTEM.
C
      CALL AIMFIL(ID1,ID2)
      REWIND U11
```

```
            READ (U11) ID1,ID2,NSEQ,LABEL,NLBL,PP,CWTYPE,
     1MM,MREF,SWTYPE,NMAX,KK,MODES,UNSYM,LMIN,LMAX,
     2JJMAX,JJ,MACH,EPS,DELTAO,(CHICP(I),I=1,PP),(NINDEX(I),I=1,MM)
      NF=MM
      NN=MREF
20    CONTINUE
C
C.....ONLY 42 CHARACTERS OF LABEL (TITLE) ARE USED.
C
      NLBL = (41+IWORDL)/IWORDL
      CALL WPLOT(ID1,ID2,PP,NF,NN,JJMAX,NFLAPS,UNSYM,LABEL, NLBL,
     1R5,
     1CHICP, NINDEX, DUMAR1, ETA, XSILIP, CORDIP,
     2X, Y, TANLLL, TANLLR, TANLTL,TANLTR, BREF, CBARB2,AR,TR,LAMDAC,
     3CBFCBW,AFAW,ETA1,ETA2,XLF1,XLF2,CF1,CF2,XS11,XS12)
      GO TO 10
      END
```

```
      SUBROUTINE WPLOT(ID1,ID2,PP,NF,NN,JJMAX,NFLAPS,UNSYM,LABEL,
     1NLBL,R5,CHICP, NINDEX, DUMAR1, ETA, XSILIP,
     2CORDIP, X, Y,TANLLL,TANLLR,TANLTL,TANLTR,BREF,CBARB2,
     3AR,TR,LAMLAC,
     4CBFCBW,AFAW,ETA1,ETA2,XLF1,XLF2,CF1,CF2,XSI1,XSI2)
      DOUBLE PRECISION ETA
      INTEGER PP, UNSYM, P, R5
      LOGICAL CONV
      REAL LAMLAC
      DIMENSION LABEL(NLBL), DUMAR1(  1  ),
     1CHICP(PP), NINDEX(NF), ETA(JJMAX)
      DIMENSION  XSILIP(JJMAX), CORDIP(JJMAX),
     1X(1), Y(1)
      DATA NCODE1 /+3/
      DATA TEN / 10.0005/
      JJMAX2=JJMAX+2
      JRATIO = (JJMAX+1)/(NN+1)
      WRITE(6,8000)
 8000 FORMAT(' ENTER ISPEED,LDEV/SCALE' )
      READ(R5,1) ISPEED, LDEV
      READ(R5,3)SCALE
C.....SETTING DEFAULT VALUES.
      IF(ISPEED .EQ. 0) ISPEED=15
      IF(SCALE .EQ. 0.) SCALE=2.
C.....SET SCALE TO 1.0 FOR A 10 MIL PLOTTER OR FOR CALCOMP.
      CONV=LDEV.EQ.0
C.....CONV=.TRUE. IMPLIES ON LINE CONVERSATIONAL USE WITH ZETA PLOTTER.
      IF(CONV) CALL PLOTS(ISPEED)
      IF(.NOT.CONV) CALL PLOTF(ISPEED,LDEV)
C.....SET CHARACTER ASPECT RATIO TO 1.
      CALL SMODE(0, 1.0)
      IF(CONV) CALL POFF
 10   CONTINUE
      WRITE(6,8001)
 8001 FORMAT(' ENTER ICONPT,ICONSF,ILABEL,ITEXT' )
C
C.....NON-ZERO INTEGERS READ BY THE FOLLOWING STATEMENT WILL
C.....CAUSE, RESPECTIVELY ..
```

```
C.....     CONTROL POINT LOCATIONS TO BE PLOTTED
C.....     FLAP AND FLAP DATA NOT TO BE PLOTTED
C.....     A NEW TITLE TO BE READ IF ITEXT=0
C.....     CONFIGURATION INFORMATION NOT TO BE PLOTTED.
C
      READ (R5,1) ICONPT, ICONSF, ILABEL, ITEXT
      IF(NFLAPS.EQ.0)ICONSF=1
      IF(ILABEL.NE.0)WRITE(6,8002)
8002  FORMAT(' ENTER LABEL' )
      IF(ILABEL.NE.0) READ(R5,2) LABEL
      WRITE(6,8003)
8003  FORMAT(' ENTER PSIZE,RSSIZE,RPLAB,CSIZE (OR DEFAULT)' )
      READ (R5,3) PSIZE,RSSIZE,RPLAB,CSIZE
      IF (CONV) CALL PCN
      IF(PSIZE .EQ. 0.) PSIZE=10.
C.....SET THE FOLLOWING DEFAULTS TO 1.0, .21, AND 1.0 FOR CALCOMP
      IF(RSSIZE .EQ. 0.)RSSIZE=15./14.
      IF (CSIZE .EQ. 0.)CSIZE=.20
      IF( RPLAB.EQ.0.)RPLAB=15 /14.
      FCTR1=PSIZE/10.
C.....PLOTTING IDENTIFICATION NUMBERS AND SETTING PEN TO MIDDLE OF PAGE.
      CALL FACTOR (SCALE)
      CALL NUMBER(0., 0., .2, FLOAT(ID1),90., -1)
      CALL NUMBER(0.,1.0, .2, FLOAT(ID2),90., -1)
      CALL PLOT(0., 1.4, 3)
      CALL PLOT (0., 5., 3)
      CALL PLOT (.25, 5., -3)
C.....DRAWING THE FREE STREAM ARROW
      CALL FACTOR(SCALE*FCTR1)
      CALL PLOT(0.0, -0.05, 3)
           CALL PLOT(0.0,+.05,2)
      CALL PLOT(.65,+.05,2)
      CALL PLOT(.65,+.12,2)
      CALL PLOT(1.0,+.00,2)
      CALL PLOT(.65,-.12,2)
      CALL PLOT(.65,-.05,2)
      CALL PLOT(.00,-.05,2)
      CALL PLOT(.00, .00,3)
```

```
C.....RESET ORIGIN AT CENTER OF WING PLOTTING AREA.
      CALL PLCT (6.05,0.,-3)
C.....THE LEADING EDGE WILL BE STORED IN X(X),Y,JJMAX+2)
C.....FROM RIGHT TO LEFT.
C.....THE TRAILING EDGE WILL BE STORED IN (DUMAR1),Y,JJMAX+2)
C.....FROM LEFT TO RIGHT.
      DO 20 J=1,JJMAX
      INDEX=JJMAX2-J
      X(J+1)=XSILIP(J)
      DUMAR1(INDEX)=XSILIP(J)+CORDIP(J)
      Y(J+1)=ETA(J)
20    CONTINUE
      X(1)=XSILIP(1) + (1.DO-ETA(1))*TANLLR
      X(JJMAX2)=XSILIP(JJMAX) + (1.DO+ETA(JJMAX))*TANLLL
      DUMAR1(JJMAX2)=DUMAR1(JJMAX+1)+(1.DO-ETA(1))*TANLTR
      DUMAR1(1)=DUMAR1(2)+ (1.DO+ETA(JJMAX))*TANLTL
      Y(1)=1.
      Y(JJMAX2)=-1.
C.....DETERMINING MINIMUM AND MAXIMUM VALUES.
      XMIN=X(1)
      XMAX=DUMAR1(1)
      DO 30 J=2,JJMAX2
      XMIN=AMIN1(X(J),XMIN)
      XMAX=AMAX1(DUMAR1(J),XMAX)
30    CONTINUE
      XRANGE=XMAX-XMIN
      XAVG=(XMAX+XMIN)/2.
C.....THE FOLLOWING IS BASED ON A 9 INCH FIGURE WIDTH AND
C.....9.9 INCH FIGURE HEIGHT.
      YRANGE=2.
      FCTR2=AMIN1(9./YRANGE,9.9/XRANGE)
      CALL FACTOR (SCALE*FCTR1*FCTR2)
C.....PLOTTING LEADING EDGE.
      X(JJMAX+3)=XAVG
      X(JJMAX+4)=1.
      Y(JJMAX+3)=0.
      Y(JJMAX+4)=1.
      CALL LINE(X,Y,JJMAX2,1,0,0)
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C.....PLOTTING LEFT SIDE EDGE.
      CALL PLOT (DUMAR1(1)-XAVG, -Y(1), 2)
C.....PLOTTING TRAILING EDGE.
      DUMAR1(JJMAX+3)=XAVG
      DUMAR1(JJMAX+4)=1.
      Y(JJMAX+4)=-1.
      CALL LINE(DUMAR1,Y,JJMAX2,1,0,0)
C.....PLOTTING RIGHT SIDE EDGE.
      CALL PLOT(X(1)-XAVG,Y(1),2)
      IF (ICONFT.EQ.0) GO TO 200
      SSIZE=.14*RSSIZE/FCTR2
C.....PLOTTING THE CONTROL POINTS.
      DO 150 N=1,NF
      INDEX =NINDEX(N)*JRATIO
      YCP=ETA(INDEX)
      DO 90 P=1,PP
      IF(MOD(N,2) .EQ. 0)I=PP+1-P
      IF(MOD(N,2) .NE. 0)I=P
      XCP=X(INDEX+1)+CHICP(I)*CORDIP(INDEX) - XAVG
      CALL SYMBOL (XCP,YCP,SSIZE, NCODE1, 0., -1)
90    CONTINUE
150   CONTINUE
200   CONTINUE
      IF (ICONSF.NE.0) GO TO 400
      XT1=XLF1+CF1-XAVG
      XT2=XLF2+CF2-XAVG
      XSE1=XSI1-XAVG
      XSE2=XSI2-XAVG
      IF(NFLAPS-2)220,300,400
220   CONTINUE
C.....PLOTTING A SINGLE FLAP
      IF(UNSYM.NE.0) GO TO 260
C.....PLOTTING A SINGLE, SYMMETRICAL FLAP, WHICH MAY
C.....HAVE A KINKED HINGE LINE.
      CALL PLOT(XT2 ,-ETA2,3)
      CALL PLOT(XSE2,-ETA2,2)
      CALL PLOT(XSE2, 0.  ,2)
      CALL PLOT(XSE2, ETA2,2)
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      CALL PLOT(XT2 , ETA2,2)
      GO TO 400
260   CONTINUE
C.....PLOTTING THE SINGLE FLAP ON AN UNSYMMETRICAL WING
      CALL PLOT(XT1 ,ETA1,3)
      CALL PLOT(XSE1,ETA1,2)
      CALL PLOT(XSE2,ETA2,2)
      CALL PLOT(XT2 ,ETA2,2)
      GO TO 400
300   CONTINUE
C.....PLOTTING A SYMMETRICAL PAIR OF FLAPS ON A SYMMETRICAL
C.....WING
      CALL PLOT(XT2 ,-ETA2,3)
      CALL PLOT(XSE2,-ETA2,2)
      CALL PLOT(XSE1,-ETA1,2)
      CALL PLOT(XT1 ,-ETA1,2)
      CALL PLOT(XT1 , ETA1,3)
      CALL PLOT(XSE1, ETA1,2)
      CALL PLOT(XSE2, ETA2,2)
      CALL PLOT(XT2 , ETA2,2)
400   CONTINUE
C.....THE PLANFORM PLOT IS FINISHED.
      CALL FACTOR (SCALE*FCTR1)
      IF (ICONPT .EQ. 0) GO TO 420
      CALL SYMBOL(5.13, .75, .14*RSSIZE, NCODE1,
     190., -1)
      CALL SYMBOL (5.2, 1.1, .14*RPLAB, 22HCONTROL POINT LOCATION,
     190., 22)
420   CONTINUE
C.....PLOTTING CONFIGURATION INFORMATION
      CALL PLOT(5.2,0.,-3)
      IF(ITEXT .EQ. 0) GO TO 480
C
C.....THE PEN SHOULD BE AT (.25+11.25*FCTR1, 5.) INCHES
C.....RELATIVE TO THE STARTING POINT.  THE PEN WILL BE
C.....MOVED TO A NEW STARTING POINT ON A NEW PAGE.
      CALL FACTOR(SCALE)
C.....THE FOLLOWING ASSUMES A 17.00 INCH PAGE LENGTH.
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      CALL PLOT(16.75-11.25*FCTR1, 0., -3)
      CALL PLOT(0., -5., -3)
      GO TO 60C
480   CONTINUE
      FCTR3=CSIZE/.21
      CALL FACTOR (SCALE*FCTR3)
      CALL PLOT(.15, -4.41,-3)
      CALL SYMBOL(.30,0.00,.21, 9HWING DATA,90.,9)
      CALL PLOT(.35 ,1.89,3)
      CALL PLOT(.35 ,0.00,2)
      CALL SYMBOL(0.6,0.,.21,12HASPECT RATIO,90.,12)
      CALL SYMBOL(0.9,0.,.21,22HLONG./LAT. REF. LENGTH,90.,22)
      XC=1.2
      CALL SYMBOL(1.2,0.,.21,11HTAPER RATIO,90.,11)
      IF(ICONSF.NE.0) GO TO 500
      CALL SYMBOL(1.5,0.,.21,9HFLAP DATA,90.,9)
      CALL PLOT(1.55,1.89,3)
      CALL PLOT(1.55,0.00,2)
      CALL SYMBOL(1.8,0.,.21,22HHINGE LINE SWEEP(DEG.),90.,22)
      CALL SYMBOL(2.1,0.,.21,19HFLAP AREA/WING AREA,90.,19)
      CALL SYMBOL(2.4,0.,.21,
     131HFLAP REF. CHORD/WING REF. CHORD, 90., 31)
      XC=2.4
500   CONTINUE
      XC=XC+.9
      CALL SYMBOL(XC,0.,.21,LABEL,90.,42)
      XC=XC-.3
      YC=6.58
      IF(ICONSF.NE.0)GO TO 510
      CALL SYMBOL(2.4,YC,.21,1H=,90.,1)
      CALL SYMBOL(2.1,YC,.21,1H=,90.,1)
      CALL SYMBOL(1.8,YC,.21,1H=,90.,1)
510   CALL SYMBOL(1.2,YC,.21,1H=,90.,1)
      CALL SYMBOL(0.9,YC,.21,1H=,90.,1)
            CALL SYMBOL(0.6,YC,.21,1H=,90.,1)
      YC=7.42
C
C.....TEN IS SLIGHTLY GREATER THAN TEN BECAUSE ALOG10 IS NOT QUIT
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C.....ACCURATE ENOUGH
C
      CALL NUMBER(0.6,YC-.21*FLOAT(IFIX(ALOG10(AMAX1(AR*TEN,.11))))+.21,
     1.21,AR,90.,5)
      CALL NUMBER(0.9,YC-.21*FLOAT(IFIX(ALOG10(AMAX1(CBARB2*TEN,
     1  .11)))) + .21,
     1.21,CBARB2,90.,5)
      CALL NUMBER(1.2,YC-.21*FLOAT(IFIX(ALOG10(AMAX1(TR *TEN,
     1  .11)))) + .21,
     1.21,TR,90.,5)
      XC=1.2
      IF(ICONSF.NE.0) GO TO 520
      IF(ABS(LAMDAC).LT.5.E-6) CALL SYMBOL(XC,YC,.21,7H .00000 ,
     190., 7)
      IF(ABS(LAMDAC).LT.5.E-6) GO TO 515
      IF(LAMDAC.GT.0.) CALL NUMBER(1.8, YC+.21-
     1.21*FLOAT(IFIX(ALOG10(AMAX1(LAMDAC*TEN
     2                                    ,.11)))),.21,LAMDAC,90.,5)
      IF(LAMDAC.LT.0.) CALL NUMBER(1.8,YC-
     1.21*FLOAT(IFIX(ALOG10(AMAX1(-LAMDAC*TEN
     I                                    ,.11)))),.21,LAMDAC,90.,5)
515   CONTINUE
      CALL NUMBER(2.1,YC-.21*FLOAT(IFIX(ALOG10(AMAX1(AFAW*TEN,
     1  .11)))) + .21,
     1.21,AFAW  ,90.,5)
      CALL NUMBER(2.4,YC-.21*FLOAT(IFIX(ALOG10(AMAX1(CBFCBW*TEN,
     1  .11)))) + .21,
     1.21,CBFCBW,90.,5)
      XC=2.4
520   CONTINUE
      XC=XC+.6
      CALL PLOT(XC, 4.41, 3)
      CALL PLOT(3.85, 4.41, -3)
C
C.....THE PEN SHOULD BE AT (.25+11.25*FCTR1+4.*FCTR3,5.)
C.....INCHES RELATIVE TO THE STARTING POINT.
C.....THE PEN WILL BE MOVED TO A NEW STARTING POINT ON A NEW PAGE.
C
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      CALL FACTOR(SCALE)
C.....THE FOLLOWING STATEMENT ASSUMES A 17.00 INCH PAGE LENGTH.
      CALL PLOT(16.75-11.25*FCTR1-4.0*FCTR3,0.,-3)
      CALL PLOT(0., -5., -3)
600   CONTINUE
      IF(CONV) CALL POFF
      WRITE(6,8006)
8006  FORMAT(' ANOTHER PLOT OF THIS WING? (1=Y,0=NO)' )
      READ (R5,1) MORE
      IF(MORE .NE. 0) GO TO 10
      IF(CONV) CALL PON
      CALL PLOT (0.,0.,999)
      RETURN
1     FORMAT(16I5)
C.....THE FOLLOWING ASSUMES AN INTEGER WORD LENGTH OF 4 CHARACTERS.
C.....CHANGE AS REQUIRED BY THE COMPUTER USED.
2     FORMAT(12A4)
3     FORMAT(8F10.0)
      END
```